

## CLAIMS

1. An arrangement for cooling a circuit board (2) or the like, which arrangement comprises:

a carrier frame (4) that comprises

- elements (41, 43, 44; 80) for connection to the circuit board (2) and for support thereon;
- a ring-like air passthrough aperture (47); and
- a miniature or subminiature fan (3) that is mounted on the side (C) of the carrier frame (4) facing away from the circuit board (2) and at a distance from the circuit board, and is equipped with a fan wheel (31) that, during operation, rotates about a rotation axis (A) and transports air through the annular air passthrough aperture (47),

there being provided on the carrier frame (4), on the side of the air passthrough aperture (47) facing toward the circuit board (2), an air-directing element (5) which serves to deflect the flow direction of at least a portion of the air transported, during operation, through the air passthrough aperture (47).

2. The arrangement according to claim 1, wherein the air-directing element (5) is implemented approximately in the manner of a bell that widens in the radial direction (R) away from the fan (3).

3. The arrangement according to claim 1 or 2, wherein the carrier frame (4) comprises, radially inside the air passthrough aperture (47), a support member (45) on which the fan (3) is arranged.

4. The arrangement according to claim 3, wherein the support member (45) is joined, via struts or the like (45a), to a part (40) of the carrier frame (4) located radially outside the air passthrough aperture (47).

5. The arrangement according to claim 4, wherein the part (40) of the carrier frame (4) located outside the air passthrough aperture (47) is implemented in the manner of a tubular segment.

6. The arrangement according to any of claims 3 to 5,  
wherein an electronically commutated motor (33) that is  
mounted on the support member (45) is provided in order to drive the  
fan (3); and

a circuit plate (6), which is implemented to connect the motor  
(33) to electrical connecting leads (61), is arranged between that  
motor (33) and the support member (45).

7. The arrangement according to claim 6,  
wherein the circuit plate (6) comprises electronic components  
for commutation of the motor (33) serving to drive the fan wheel  
(31).

8. The arrangement according to claim 6 or 7,  
wherein the electrical connecting leads (62) are guided in the  
carrier frame (4), and are implemented at their circuit-board end  
(D) for electrical contacting with the circuit board (2).

9. The arrangement according to claim 8,  
wherein the connecting leads are implemented as wire  
connections (61) that are at least partially surrounded by a sheath  
(51) that is constituted by parts of the carrier frame (4) and/or of  
the air-directing element (5).

10. The arrangement according to claim 5,  
wherein the outer side of the fan wheel (31), together with  
the inner side (47a) of the part (40) implemented in the manner of a  
tubular segment, forms an annular space (47) inside which, during  
operation, the blades (32) of the fan wheel (31) rotate.

11. The arrangement according to claim 10,  
wherein the cross section of the annular space (47) widens in  
the direction toward its outlet.

12. The arrangement according to any of the preceding claims,  
wherein the carrier frame (4) comprises, on its side facing  
away from the circuit board, an end surface (42) on which a sealing  
ring (7) is arranged.

13. The arrangement according to claim 12, wherein a depression, inside which the fan (3) is arranged, is provided inside the end surface (42).

14. The arrangement according to any of the preceding claims, wherein the air-directing member (5) is equipped with penetrations (60, 62; 64, 66; 68; 70, 72; 74, 76, 78) in order to direct, through a wall of the air-directing member (5), a portion of the air flow delivered by the fan (3).

15. The arrangement according to any of the preceding claims, wherein the fan (3) is implemented to transport, through the air passthrough aperture (47), air coming from the air-directing element (5).

16. The arrangement according to any of the preceding claims, wherein the fan (3) is implemented to transport air through the air passthrough aperture (47) in a direction that goes from the air passthrough aperture (47) to the air-directing element (5), in order to deflect the air at that element in a direction away from the rotation axis (A) of the fan (3).

17. A carrier frame for installation of a fan (3) at a distance from a circuit board (2), which carrier frame (4) comprises a support member (45) that, in the installed state, is at a distance from the circuit board (2) and is implemented as a carrier for a motor (33) of the fan (3),

which support member (45) is surrounded by an air flow passage (47) that in turn is surrounded by an outer air-guiding member (14) that is joined via at least one joining member (45a) to the support member (45), which joining member (45a) crosses the air flow passage (47);

installation elements (41, 43, 44; 80) being provided for installation of the carrier frame (4) on the circuit board (2); and an air-directing member (5) being provided on the support member (45) on the latter's side facing toward the circuit board (2).

18. The carrier frame according to claim 17,  
wherein the air-directing element (5) is implemented  
approximately in the manner of a bell whose open side faces toward  
the circuit board (2).

19. The carrier frame according to claim 17 or 18,  
wherein the support member (45) is joined, via struts (45a),  
to a part (40) located radially outside the air passthrough aperture  
(47).

20. The carrier frame according to claim 19,  
wherein the part (40) located outside the air passthrough  
aperture (47) is implemented in the manner of a tubular segment.

21. The carrier frame according to any of claims 17 to 20,  
wherein an electronically commutated motor (33) that is  
implemented for mounting on the support member (45) is provided in  
order to drive the fan (3).

22. The carrier frame according to claim 21,  
wherein a circuit plate (6) implemented to connect the motor  
(33) to electrical connecting leads (61) is arranged between that  
motor (33) and the support member (45).

23. The carrier frame according to claim 22,  
wherein the circuit plate (6) comprises electronic components  
for commutation of the motor (33).

24. The carrier frame according to claim 22 or 23, in which  
the electrical connecting leads (62) are guided, which leads are  
embodied at their circuit-board end (D) for electrical contacting  
with the circuit board (2).

25. The carrier frame according to claim 24,  
wherein the connecting leads are implemented as wire  
connections (61) that are at least partially surrounded by a sheath  
(51) that is constituted by parts of the carrier frame (4) and/or of  
the air-directing element (5).

26. The carrier frame according to claims 20 and 21, wherein the outer side of the fan wheel (31) forms, together with the inner side (47a) of the part (40) implemented in the manner of a tube section, an annular space (47) inside which, during operation, the blades (32) of the fan wheel (31) rotate.

27. The carrier frame according to claim 26, wherein the cross section of the annular space (47) widens in the region of at least one end portion.

28. The carrier frame according to any of claims 17 to 27, which comprises on its side facing away from the circuit board (2) an end surface (42) on which a sealing ring (7) is arranged.

29. The carrier frame according to claim 28, wherein a depression for receiving a fan (3) is provided inside the end surface (42).

30. The carrier frame according to any of claims 17 to 29, wherein the air-directing member (5) is equipped with at least one penetration (60, 64, 66, 68, 70, 72, 74, 76, 78).

31. A carrier frame for installation on a circuit board (2), which frame is implemented in the manner of an oil-drilling rig and comprises a platform (117) that is equipped with supporting legs (105, 106, 107, 108) for mounting on the circuit board (2), and which comprises at the center of the platform (117) a depression (121, 123) that is implemented for installation of a fan (3) at a distance from the circuit board (2), the outer wall (123) of the depression (121, 123) forming part of the fan.

32. The carrier frame according to claim 31, wherein the supporting legs (105 to 108) are implemented integrally with the platform (117).

33. The carrier frame according to claim 31 or 32, wherein the supporting legs (105 to 108) are implemented in at least partially hollow fashion.

34. The carrier frame according to one of claims 31 to 33, wherein at least one supporting leg (107, 108) is equipped with a latching element (107b, 108b) for latching into an associated opening (113) of the circuit board (2).

35. The carrier frame according to any of claims 31 to 34, wherein at least one supporting leg (105, 106) is provided which comprises no latching element and is longer than a supporting leg (107, 108) equipped with a latching element (107b, 108b).

36. The carrier frame according to any of claims 31 to 35, wherein at least one supporting leg (105, 106) is provided which comprises no latching element and comprises at its free end a portion (110, 111) whose diameter is implemented in complementary fashion to the diameter of a predetermined opening (112) of the circuit board (2), which opening is associated with that supporting leg.

37. The carrier frame according to any of the preceding claims, on which are provided electrically conductive elements (61) that are implemented to form, upon installation of the carrier frame on a circuit board (2), an electrical connection to a counterelement (114) provided on the circuit board.

38. The carrier frame according to claim 37, wherein the electrically conductive elements are implemented in the manner of pins (61).

39. The carrier frame according to claim 37 or 38, wherein the electrically conductive elements (61) are electrically connected to a circuit plate (6) that is implemented to deliver electrical energy to a fan (3) arranged on the carrier frame (104).

40. The carrier frame according to claim 39, on which the circuit plate (6), in the installed state, is immobilized in a predetermined position.

41. The carrier frame according to claim 40,  
wherein at least one latching spring (140, 142) is provided  
for immobilization of the circuit plate (6), which spring latches  
the circuit plate (6) in a predetermined position.